USING REPEAT TRACK INTERFEROMETRY TO ESTIMATE SMALL SCALE SURFACE CHANGES ON VENUS

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Subsequent to its insertion into Venus orbit in August of 1990 the Magellan spacecraft collected synthetic aperture radar (SAR) data over 98% of the planet's surface. Because Venus' spin rate is very small, completing one rotation in every 243 days (one cycle), Magellan was able to image a large portion of the planet's surface during each of its three mapping cycles, Although the look angle geometry was changed during each the three cycles a limited number of orbits were collected having the same imaging geometry and arc thus potentially suitable for interferometry. Repeat pass interferometry is only possible if the spacing between the orbits (baseline) is smaller than the critical distance determined the radar resolution, distance to target, radar wavelength, and the incidence angle, approximately 300 m for Magellan. Because of uncorrected orbital drift during the 243 days between imaging passes, and the burst operation of the Magellan radar, only a small portion of the data collected during the mapping passes is suitable for interferometry. Furthermore, the uncertainty in standard Magellan ephemerides is larger than the critical separation distance by an order of magnitude. It is therefore necessary to use the SAR data to obtain accurate relative ephemeris information. By removing the amount of decorrelation due to thermal noise estimated from the Magellan radar system parameters and the baseline decorrelation from the improved relative ephemeris we associate the remaining decorrelation in the interferogram to changes in the scene during the intervening time between observations. This decorrelation can then be related to the amount small scale surface deformation.

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